NTIP Functional/Technical Requirements
Draft
Deliverable-K

NORTHERN TIER INTEROPERABILITY PROJECT

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1 Overview

The Northern Tier Interoperability Project (NTIP) provides many challenges for the design of a law enforcement radio system. The area spans over 550 miles, including the entire Montana-Canadian border. This region includes large expanses of relatively flat ranchland and farmland in the central and east, as well as the extremely mountainous terrain of the Continental Divide region in the western counties. Although most of the area is sparsely populated, there are several municipalities with significant population density. The Northern Tier Interoperability Project also encompasses four Indian tribal reservations and the Glacier National Park. These areas provide their own challenges due to the legal status of the Indian Nations and the environmental restrictions within the park.

The unique challenges of the Northern Tier area combined with the varying needs of the many state, local, tribal and federal agencies add additional complexity to the radio system design. Each of these users brings their own set of needs that when combined define the requirements of the system.

The NTIP system is designed to balance these requirements with the economic realities of the available funding. This system when completed will provide voice and data radio services to the many member agencies, as well as insuring effective interoperability between these agencies. The project includes the development of a digital interconnection and back-haul network to support this system and other public safety applications.

The majority of Montana's existing public safety voice radio systems rely upon 30–year old technologies. These systems represent local, state and federal agencies alike. Some radio sites exceed 40 years in age and are in immediate need of repair or replacement. Similarly, a significant amount of user equipment will soon exceed its useful life and require replacement within the next three to five years. This aging communications infrastructure increases maintenance requirements, reduces reliability and jeopardizes public safety. External factors such as the FCC's edict on VHF narrowbanding also add to the need for change.

1.1 Statewide Public Safety Radio Communications: The Plan

The Statewide Public Safety Radio Plan is targeted at achieving a number of significant benefits for the State of Montana. These include:

- Increased System Reliability. The replacement of obsolete equipment, system redundancy and an effective long-term maintenance strategy will provide reliable radio communications to Montana's public safety and service agencies.

- Improved Interoperability. Developing a shared, wide area multi-agency communications system in a common frequency band will enhance interoperability among public safety agencies and with public service partners. Interoperability with non-participating agencies will be maintained through established mutual aid channels.

- Statewide Radio Coverage. Public safety and service partners will benefit from expanded coverage in remote areas such as western Montana's mountainous terrain and eastern Montana's expansive plains, as well as in buildings and through urban canyons.

- Enhanced Functionality. Public safety and public service providers will benefit from the advanced features of digital, trunking and mobile data technologies. This enhanced functionality can provide increased efficiencies and flexibility in the field.

- Reduced Interference. A statewide public safety spectrum strategy and improved frequency coordination will reduce interference from adjacent channel and unlicensed users.

- Universal, Statewide Access. Montana's public safety and public service providers will benefit from the increased reliability, statewide coverage, seam-less roaming, universal access to dispatch and cost efficiencies that make radio communications not only accessible statewide, but affordable.

Although wholesale replacement of systems is not out of the question, the general political climate in the state favors using existing infrastructure to the fullest extent possible. Various public safety agencies have collocated sites across the state and have historically coordinated quite well on Land Mobile Radio (LMR) issues and procurements. The collocation and

sharing of communications infrastructure has created a strong relationship among these agencies and provided a firm foundation to move forward on interoperability initiatives.

The State of Montana envisions a partnership of public safety and public service providers by which enhanced statewide communications capabilities are made possible. The Montana SIEC has endorsed The Statewide Public Safety Radio Plan that enables Montana to achieve its vision of the future. It encompasses a partnership among public safety and public service providers, a spectrum plan, the implementation of advanced technologies and a commitment to long-term maintenance and support. The Northern Tier Interoperability Project is the realization of this vision for the highline region.

1.2 Concept Demonstration Projects

A key to the Montana's success thus far in creating an SIEC has been its ability to move forward with small, incremental steps. Concept Demonstration Projects (CDPs or pilots) are these incremental steps. The full potential of a secure public safety radio system can only be realized through cooperative partnerships, sharing of common components, and interoperability between agencies. Agencies with current or planned communications projects will be key participants. By identifying key opportunities to move forward, the participants have done a good job of easing into a potentially complicated process.

Concept Demonstration Projects, such as NTIP, are being implemented to provide backbone technology across large geographic regions and subsequently to deploy digital technology to all users. Additional phases will be prioritized based on funding availability, emergent needs and federal narrowband mandates.

1.3 Overview of (CDP II) Northern Tier Interoperability Project (NTIP)

Montana's Northern Tier Interoperability Project (NTIP) is a CDP focused on homeland security. The NTIP will provide a consolidated local, state, tribal and federal radio system for law enforcement purposes. With over 550 miles of border with Canada, Montana law enforcement officials have

critical communications interoperability requirements between levels of government and across jurisdictions. The NTIP radio system will provide advanced digital, secure voice and data communications for law enforcement interoperability across this vital border region. It will also improve homeland security by providing the means for military and civil authorities to communicate with each other by radio.

The Northern Tier Interoperability Project (NTIP) is a partnership of local, state, tribal, and federal government agencies, each have challenging requirements for radio communications. Several have projects already underway and NTIP will interconnect standards-based systems to make the most of existing resources, extend them to neighboring cooperators, and expand capabilities for all. The Montana National Guard's homeland security mission will be enhanced through highly reliable, redundant communications capabilities to its Highline armories.

The Northern Tier Interoperability project when completed will create the following shared resources to support the many agencies involved with Homeland Security across the Highline:

- Digital Interconnection backbone network consisting of a hybrid of microwave and terrestrial carrier circuits providing connectivity between all agencies and dispatch locations. This backhaul network will be used to carry both voice and mobile data traffic. It would also have the extended benefit of providing other state agency use for Montana Highway Patrol, Montana DOT and the National Guard.

- New Project 25 infrastructure repeaters and control stations providing a digital standard for interoperability across the High-line (Canadian border).

- Project 25 field units for specific law enforcement agencies for direct secure communications with all federal, state and local law enforcement agencies.

- Mobile data expansion of the Montana shared mobile data network across the high-line providing access to state and federal databases.

1.3.1 Purpose

The Northern Tier Interoperability Project (NTIP) is the second concept demonstration project for Montana's multi-jurisdictional, shared radio system for public safety. NTIP's basic purpose is to improve communications between local law enforcement, state, federal, and tribal authorities by providing digital voice and data radio capabilities along Montana's highline border area.

1.3.2 Partnerships

NTIP Consortium is a partnership of local, state, tribal, and federal government agencies, each of whom have challenging requirements for radio communications. Several have projects already underway and the NTIP system will interconnect these standards-based systems to make the most of existing resources, extend them to neighboring cooperators, and expand capabilities for all. The membership and structure of the NTIP Consortium is expected to evolve over time. Section 1.4 details the current members and outline the future potential partners.

1.3.3 Features

Basic features which will be provided by the Northern Tier Interoperability Project when complete include:

- Secure digital communications using conventional Project 25 (P25) voice systems
- Standardized mobile data access to local, state, and federal databases of law enforcement information (CJIN, NLETS, NCIC)
- Backbone for interconnecting dispatch centers, emergency operations centers, and other public safety facilities

1.3.4 Agency Benefits

It is critical to the success of the Northern Tier Interoperability Project, that each member agency receives direct benefits from the implementation of the system. The design of a system to support such a wide range of system users required a deep understanding of the expectations of such a wide range of participants. Many of these expectations are reflected in the technology decisions contained in the SIEC standards.

1.3.4.1 Local Law Enforcement

P25 digital standards provide secure, direct voice communications capabilities with Federal agencies and tribal authorities critical during emergency operations, as well as improved day-to-day communications security for all. Secure communications between local dispatch centers and federal radio users, such as FBI, BIA, and Border Patrol will enhance officer safety and confidentiality by allowing sensitive information that would otherwise not be available to be passed to field personnel. In addition, improvements in radio coverage will reduce communications dead spots.

Mobile data allows direct access to national, state, and local sources of information on wanted individuals and stolen property, including vehicles. It speeds information to officers by relieving dispatch of the effort and voice radio channels of the traffic. Mobile data provides silent and secure data communications between individual field users and from them to dispatch.

The interconnection backbone will provide connectivity between all dispatch centers and to appropriate federal installations. It can also be used to interface remote communications sites to dispatch centers, providing better communication.

1.3.4.2 Tribal Law Enforcement

Tribal law enforcement authorities will benefit similarly. Critical communications with the FBI, BIA, and other federal law enforcement agencies with jurisdiction within tribal boundaries will be more secure and reliable. The four tribal reservations across Montana's highline will benefit from improved, more secure communications with all law enforcement agencies, direct access to shared information, and more timely broadcasts of critical alerts.

1.3.4.3 Montana Army National Guard

Standardized interconnection capabilities across Montana's highline will establish a portion of the communications redundancy necessary for command and control of Montana Army National Guard armories across the highline. Secure voice communications capabilities will provide interoperability for National Guard units in services to civilian authorities for homeland security and during times of disaster.

1.3.4.4 Montana Highway Patrol

The project will extend cooperative efforts currently underway between the MHP and ten counties and cities elsewhere in Montana for a shared mobile data infrastructure. The interconnection backbone network will provide necessary interconnections between mobile data sites and dispatch centers. It will provide secure communications between MHP and other state, local, tribal, and federal law enforcement agencies.

1.3.4.5 Montana Department of Transportation

The project will provide the Montana Department of Transportation with microwave capacity for future Intelligent

Transportation Systems safeguarding hazardous materials being transported by trucks, as well as highway monitoring and alerting services to other public safety agencies. Mobile data capabilities may be used by various agencies to track commercial carriers in cooperation with the Montana Department of Transportation.

1.4 Participating NTIP Agencies

The NTIP system will eventually support all of public safety across the region, however the system being implemented through this procurement is specifically targeted at the Local, Sate and Federal law enforcement agencies in the region.

The following list of agencies is based on an early projection of the NTIP project scope. Most of these agencies may be involved with later phases; however only those indicated are active participants in this procurement. The procurement shall provide each of these participating agencies with communications meeting the requirements detailed in this document.

County	Participating
Roosevelt Co. Sheriff	X
Sheridan Co. Sheriff	X
Daniels Co. Sheriff	X
Valley Co. Sheriff	X
Phillips Co. Sheriff	X
Blaine Co. Sheriff	X
Hill Co. Sheriff	X
Liberty Co. Sheriff	X
Toole Co. Sheriff	X
Glacier Co. Sheriff	X
Flathead Co. Sheriff	X
Lincoln Co. Sheriff	X

Municipal	Participating
Poplar PD	
Fort Peck PD	X
Wolf Point PD	X

Plentywood PD	X
Nashua PD	
Glasgow PD	X
Chinook PD	
Havre PD	X
Cut Bank PD	
Kalispell PD	X
Whitefish PD	X
Columbia Falls PD	X
Eureka PD	X
Libby PD	
Troy PD	

Tribal	**Participating**
Fort Peck Agency	
Ft. Belknap Agency	X
Rocky Boy Agency	X
Blackfeet Agency	X
Salish and Kootania Tribe	X

State	**Participating**
DOJ	
Highway Patrol Division	
Criminal Investigations Bureau	
Narcotics Investigation Bureau	
Fire Prevention & Investigations Bureau	
Gambling Investigation Bureau	
Military Affairs	
Army National Guard	
FWP	
Enforcement Division	
Livestock	
Brands Enforcement Division	
Corrections	

Crossroads Correctional Center	
MDT	
Motor Carrier Services Division	
Maintenance Division	

Federal	**Participating**
Customs (Great Falls)	
DEA (Billings)	
INS (Helena)	
INS - Raymond	
FBI – Glasgow	
U.S. Probation - Glasgow	
BLM - Malta	
Border Patrol - Havre	
BLM - Havre	
FBI - Havre	
INS - Sweetgrass	
FBI – Browning	
U.S. Probation - Browning	
FBI – Kalispell	
USFS – Kalispell	

2 Current Systems

The proposed system is intended to supplement and/or replace the existing radio systems currently in use by the member agencies. Most of these radio systems operate in the VHF High Band (150 to 174 MHz). Portions of these radio systems may be integrated into the new system, particularly where the existing system has already migrated to P25 compatibility. A few member agencies use VHF Low Band (30 to 50 MHz). These radio systems are to be replaced by the proposed system.

2.1 Agencies System Descriptions

The majority of the systems being upgraded belong to the local law enforcement agencies in the region. These are principally the Sheriff's

Office of each County, the Municipal Police Department of the cities within these counties, and the law enforcement agencies of the Tribal Reservations. The NTIP system will also support the operation of the Montana Highway Patrol and the enforcement activities of the Montana Department of Transportation across the region.

2.1.1 Sheridan County

Sheridan County Sheriff

The current Sheridan County Sheriff system operates on one frequency pair. The repeater channel is available at two base sites. One of these sites operates as a base and control station and the other site operates as a repeater. The repeater is controlled over a microwave link from the Courthouse. The system as designed provides less that acceptable coverage. Current law enforcement loading consists of approximately nine portable units and fifteen mobile units. Dispatch is conducted from an older version of Motorola CentraCom console system.

Plentywood Police Department

The current Plentywood Police Department system operates on one simplex channel. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately four portable units and eleven mobile units.

2.1.2 Daniels County

Daniels County Sheriff

The current Daniels County Sheriff system uses two frequency pairs. One channel is available at three base sites. One of these sites operates as a fixed base and the two other sites are repeaters. The second channel is available at two base sites. One of these sites operates as a control station and the other site is repeater. The repeaters are wireline controlled. The system as designed provides acceptable coverage. Current law enforcement loading consists of fewer than twenty units with

approximate 50% being P25 capable. Dispatch is conducted from a desktop control station.

2.1.3 Roosevelt County

Roosevelt County Sheriff

The current Roosevelt County Sheriff system uses two frequency pairs. The primary channel is available at five repeater sites. CTCSS selection is used to select repeaters. The secondary channel is available at one repeater site. The system as designed provides excellent coverage. Current law enforcement loading consists of approximately fifty portable units and twenty mobile units. Dispatch is conducted from a two position Motorola CentraCom Gold Elite console system. control station. Dispatch and some channels are shared with Fort Peck reservation.

Wolf Point Police Department

The current Wolf Point Police Department system operates on one simplex channel. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately eight portable units and eight mobile units.

Poplar Police Department

The current Poplar Police Department system operates on one simplex channel. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately ten portable units and ten mobile units.

2.1.4 Valley County

Valley County Sheriff

The current Valley County Sheriff system operates on one frequency pair. The channel is available at three base sites. One of these sites operates as a fixed base and the two other sites are repeaters. Current law enforcement loading consists of approximately eleven portable units and

fourteen mobile units. Dispatch is conducted from a Motorola CentraCom Gold Elite console system.

Glasgow City Police

Glasgow Police Department operates on one simplex frequency from one base site. The system supports approximately nine portable units and five mobile units. The system as designed provides acceptable coverage.

2.1.5 Phillips County

Phillips County Sheriff

The current Phillips County Sheriff system operates on one frequency pair. The channel is available at two repeater sites. Current law enforcement loading consists of approximately eight portable units and eight mobile units. Dispatch is conducted from a Zetron console system.

2.1.6 Blaine County

Blaine County Sheriff

The current Blaine County Sheriff system operates on two frequency pairs. Each channel is available from an independent repeater sites. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately eight portable units and eight mobile units. Dispatch is conducted from a Motorola CentraCom Gold Elite two position console system.

2.1.7 Hill County

Hill County Sheriff

The current Hill County Sheriff system operates on one frequency pair. This channel is available at two sites. One of these sites operates as a base and control station and the other site operates as a repeater. The system as designed provides less that acceptable coverage. Current law

enforcement loading consists of approximately fourteen portable units and twelve mobile units. Dispatch is conducted from a Motorola CentraCom Gold Elite two position console system.

Havre Police Department

The current Havre Police Department system operates on one frequency pair and three simplex channels. All channels operate from a single site. The system as designed provides acceptable coverage, however improved in-building coverage is desired. Current law enforcement loading consists of approximately eighteen portable units and seven mobile units. Dispatch is conducted from a Zetron console system.

2.1.8 Liberty County

Liberty County Sheriff

The current Liberty County Sheriff system operates on one frequency pair. The repeater channel operates from a single site. A base/control station is used for dispatch. The system as designed provides an acceptable level of coverage. Current law enforcement loading consists of approximately five portable units and five mobile units. Dispatch is conducted from a Motorola MC500 console system.

2.1.9 Toole County

Toole County Sheriff

The current Toole County Sheriff system operates on one frequency pair and one simplex channel. The repeater channel is available at two base sites. One of these sites operates as a base and control station and the other site operates as a repeater. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately ten portable units and twelve mobile units. Dispatch is conducted from a two position Motorola CentraCom Gold Elite console system.

2.1.10 Glacier County

Glacier County Sheriff

The current Glacier County Sheriff system operates on three channels. Two are repeater pairs on two different sites. One channel is simplex. The system as designed provides acceptable coverage, however improved coverage is desired. Current law enforcement loading consists of approximately twenty-one portable units and five mobile units. Dispatch is conducted from a two position Motorola CentraCom Gold Elite console system.

2.1.11 Flathead County

Flathead County Sheriff

The current Flathead County Sheriff system operates on two frequency pairs. Each channel is available from an independent repeater sites. The primary site provides most of the available coverage. The second channel is available from a low power solar site. The system as designed does not provide acceptable coverage. Current law enforcement loading consists of approximately fifty portable units and fifty mobile units. Dispatch is conducted from a four position Motorola CentraCom Gold Elite console system.

Kalispell Police Department

The current Kalispell Police Department system operates on one repeater frequency pair and one simplex channel. Both channels operate from one site. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately twenty-four portable units and twelve mobile units. Dispatch is conducted from a three position Motorola CentraCom Gold Elite console system.

Columbia Falls Police Department

The current Columbia Falls Police Department system operates on three simplex channels. All channels operate from a single site. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately eighteen portable units and eight mobile units. Dispatch is conducted from a single position Motorola CommandStar console system

Whitefish Police Department

The current Whitefish Police Department system operates on one repeater pair and one simplex channel. Both channels operate from a single site. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately sixteen portable units and nine mobile units. Dispatch is conducted from a two position Motorola CentraCom Series II console system

2.1.12 Lincoln County

Lincoln County Sheriff

The current Lincoln County Sheriff system uses one frequency pair. The primary channel is available at five repeater sites. CTCSS selection is used to select repeaters. The system as designed provides less than acceptable coverage due to the severe terrain. Current law enforcement loading consists of approximately twenty-nine portable units and twenty-five mobile units. Dispatch is conducted from a two position Motorola CentraCom Gold Elite console system.

Eureka Police Department

The Eureka Police Department operates on one simplex frequency and shares repeater access with Lincoln County Sheriff. The system supports approximately six portable units and three mobile units. The system as designed provides acceptable coverage. Dispatch is provided by two control station radios.

Troy Police Department

The Troy Police Department shares repeater access with Lincoln County Sheriff. The system supports approximately three portable units and three

mobile units. The system as designed provides acceptable coverage. Dispatch is provided by a control station radio.

2.1.13 Indian Tribal Reservations

Blackfeet Tribe

Blackfeet Reservation Law Enforcement operates on one repeater pair from one site. The system as designed does not provide acceptable coverage. Current law enforcement loading consists of approximately ten portable units. Dispatch is conducted from a Motorola CentraCom Gold Elite two position console system.

Fort Belknap Reservation

The Fort Belknap law enforcement current system uses one frequency pair. The channel is available at two repeater sites. The system as designed provides acceptable coverage except for portable operation in certain mountain areas. Current law enforcement and Fish & Game loading consists of approximately twenty-four portable units and thirty mobile units. Dispatch is conducted from a desktop control station.

Fort Peck Reservation

The current Fort Peck Reservation law enforcement system uses one frequency pair. The channel is available at three repeater sites. CTCSS selection is used to select repeaters. The system as designed provides good coverage. Current law enforcement loading consists of approximately forty portable units and forty mobile units. Dispatch is conducted from a two position Motorola CentraCom Gold Elite console system shared with Roosevelt County.

Rocky Boy Reservation

The current Rocky Boy Reservation law enforcement system uses one frequency pair. The channel is available at one repeater site. The system as designed provides acceptable coverage. Current law enforcement loading consists of approximately twelve portable units and twelve mobile units. Dispatch is conducted from a desktop control station.

2.1.14 Montana State Agencies

Montana Highway Patrol

The current Montana Highway Patrol system uses one frequency pair and additional simplex channels in each of its operating areas. The repeater channel is available at up to eight repeater sites in each area. CTCSS selection is used to select repeaters. The system as designed provides 85% to 90% coverage with the several areas of reduced coverage. This level of coverage is not deemed acceptable. Current loading consists of approximately 220 portable units and 230 mobile units Statewide. Dispatch is conducted from Helena utilizing multi-channel base/control station located throughout the State.

2.2 Agencies Needs and Problems

The local agencies have many of the same concerns. These include obsolete equipment, lack of interoperability, coverage difficulties, lack of encryption, and other shortfalls typical of systems implemented over the past 20 to 30 years. The following table (Table 3-X) provides a list of some of the current issues that have been voiced by the NTIP member agencies. This table is not intended to be an exhaustive list of the current issues. It shall be the responsibility of the bidder to verify the specific needs of the member agencies during the final detailed design.

Reported Existing System Issues

County	Agency	Issue
Valley	Valley County Sheriff	Coverage from Ophiem Site towards Canada due to coordination restrictions
		Communications with Tribal agencies and federal agencies
		Lack of encryption
		Dispatch Center improvements
	Glasgow Police	Communications with Tribal agencies and federal agencies
		Lack of encryption
		Dispatch Center improvements

County	Agency	Issue
Sheridan	Sheridan County Sheriff	Coverage issues in the four corners of the county
		Channel congestion due to multiple agencies sharing channels
		Lack of Interoperability with U.S. Border Patrol
Hill	Hill County Sheriff	Coverage issues in the northern area of the county due to terrain and antenna pattern restrictions for coordination with Canada
	Havre Police Department	Coverage is generally good, but improved in-building coverage is desired
		Lack of interoperability with Hill county and surrounding counties, Montana Highway Patrol, Federal agencies, such as U.S. Border Patrol, U.S. Customs and FBI, and other local emergency services
		Lack of encryption capability
Glacier	Blackfeet Tribe	Coverage issues: Northern remote areas (Chief Mountain) South edge (Swift Current Heart Butte) The river basin areas Del Bonita border crossing area
		Obsolete equipment
Roosevelt	Fort Belknap	Coverage issues, portable operation in certain mountain areas
		Lack of encryption
Flathead	Flathead County Sheriff	Coverage issues west towards Libby
		Aging equipment
Lincoln	Lincoln County Sheriff	Coverage due to severe terrain

Table 3-X

3 NTIP System Concept

The NTIP System design concept is reflected in the Baseline Design document attached as Appendix A. This Baseline Design is intended to set a direction for the overall system. The bidders are requested to use this design to the greatest extent possible in their proposal. If deviation is required, the bidder shall provide a detailed explanation justifying the decision.

The bidder is encouraged to provide system solutions beyond those described in the baseline design with appropriate explanation.

3.1 NTIP Baseline Design Overview

The voice radio system is intended to meet the functional and coverage requirements of the many user agencies. The voice system is to be designed to support two primary types of user agencies.

- Local area users, who are generally the counties, municipalities, and tribal agencies.
- Wide area users, who are the state, and federal agencies.

The primary difference between these two user groups is their coverage requirements.

- The local agencies require thorough and reliable coverage in the area defined by their jurisdictional boundaries
- The wide area users require the ability to communicate across the entire Northern Tier region.

While both of these groups require the functionality provided by a modern digital voice radio communications system, not all users require every function. These two groups of users drive the requirement for a two-level design with a wide area system operating as an overlay to local systems in each county. The careful application of a variety of VHF P25-type system architectures should accomplish this goal without significant compromises.

Each of the agencies supported by the radio system must be provided with dispatch equipment to access the system for normal communications

on the appropriate local area system or wide area system and for interoperable communications on the wide area system.

3.1.1 VHF P25 Wide Area Trunked System

The wide area systems users' needs are expected to be met by a VHF P-25 multi-site linked trunked system. This system shall provide primary service for the agencies that require wide area communications, and secondary communications for the local agencies that require service outside their normal coverage. Additionally, the wide area system shall furnish the fundamental interoperability for all the participating agencies which the NTIP program is chartered to provide.

This system is expected to be made up of approximately 10 to 12, interconnected four-channel trunked radio sites. These sites shall be strategically located to provide 95% reliable mobile coverage across the Northern Tier region. The bidder is responsible for the selection of the specific radio sites and the resulting radio coverage. The bidder shall also be responsibility for the specific number of channels proposed for use at each site.

The use of interconnected trunked radio sites is intended to allow the users to automatically roam across the system without the need for user intervention. The system users shall be able to communicate without having to know what site the other users are operating from.

The specific number of trunked radio sites and the number of channels located at each site will be determined during the final detailed design which is a deliverable of this procurement. The bidder shall provide information in their proposal describing the methodology used to determine specific sites and number of channels proposed. This methodology shall be consistent with that which will be used during the final detailed design.

The trunked system central control hardware shall be located at a secure site with reliable interconnection to the radio transmitter and dispatch center sites. This equipment may be specific to the control needs of the NTIP system, or may be shared with other

systems within the State, such as the Lewis & Clark County system. The bidder shall propose both a stand alone controller and an expansion of the Lewis and Clark controller, as an option, if possible within their system architecture. The bidder shall provide their best recommendation and a detailed explanation of the advantages and disadvantages of each configuration.

The agencies that use the wide-area trunked system shall be provided dispatch access connected directly to the system infrastructure at principal dispatch locations. Control station access is acceptable for secondary dispatch locations.

3.1.2 VHF P25 Local Area Conventional Systems

The majority of local users (counties, municipalities, and Indian tribal reservations) shall operate on conventional radio systems designed to provide the coverage and capacity required by those agencies. These systems, while anticipated to be architecturally similar, shall be designed specifically to the requirements of each local area.

Each of the local systems shall typically consist of one or more radio sites with a total of 3 to 5 radio channels. These channels will be assigned to the law enforcement agencies responsible for the county and any municipalities or other agencies within the county. These channels, while not used in a trunked configuration shall provide the full range of P-25 features, including unit ID, emergency call, and the ability to use secure communications.

The specific number and location of radio sites and the number of channels located at each site will be determined during the final detailed design which is a deliverable of this procurement.

Many of the agencies of the NTIP Consortium use their existing analog voice radio systems to meet their requirements for paging and alerting. This functionality will continue to be a requirement for those agencies. The proposed voice radio system shall be capable of multi-mode (P25 Digital and Analog) operation. The systems will be fully compatible with analog tone paging when used in the analog mode.

3.1.3 VHF P25 Local Area Trunked Systems

The Baseline Design anticipates a different design approach for two areas' unique local coverage systems. The area of Flathead County (including Whitefish, Kalispell, and Big Fork), and the area of Hill County (including Havre) are expected to be supported by multi-site trunked systems. These systems shall operate as sub-systems of the wide area trunked network.

The specific number of trunked radio sites and the number of channels located at each site for each of these local sub-systems will be determined during the final detailed design which is a deliverable of this procurement.

The agencies that use the local-area trunked systems shall be provided dispatch access either through console systems connected directly to the system infrastructure or control station access. The bidder shall provide the rational used to make this determination on an agency-by-agency basis.

The bidder shall provide in their proposal a recommendation as to the use of trunking sub-systems to provide local coverage in other counties. This may be based on a county-by-county basis, through the creation of sub-regions covering more than one county, or through the enhancement of the wide-area system to meet the requirements of the local system users.

Many of the agencies of the NTIP Consortium use their existing analog voice radio systems to meet their requirements for paging and alerting. This functionality will continue to be a requirement for those agencies. Any trunked system proposed as a replacement of local conventional systems must address this functionality.

3.1.4 Digital Microwave and Leased Carrier Interconnection System

The Northern Tier Interoperability Project voice radio systems of this procurement and future voice and data radio systems will rely on the

creation of a consistent and reliable transport network to interconnect the many agencies and the supporting sites.

The Montana SIEC has selected digital microwave technology as the primary interconnection method for interoperable radio systems. While digital microwave does have many advantages, the expanse of the area to be covered combined with the challenges presented by the unique terrain and the special requirements within Glacier National Park may make a microwave-only system impractical.

The bidder shall consider the trade-offs between microwave and optical fiber or other terrestrial based leased links. The bidder shall provide a recommendation for the design and routing of a hybrid system using a combination of technologies will best meet the needs of the NTIP systems.

Microwave links that support only fixed radio sites are anticipated to carry DS-3 capacity. Microwave links that carry traffic between dispatch centers or which make up "back-bone" segments carrying traffic to several fixed radio sites should be OC-3 capacity. The bidder shall provide a detailed narrative providing the rational for the capacity selection of each proposed microwave link.

The bidder shall specify the required capacity of each leased link in the proposed system design. The bidder shall provide a detailed narrative providing the rational for this capacity.

3.2 Phase of Statewide System

The State of Montana, through the actions of the State Interoperability Executive Counsel (SIEC), have set the goal of creating an interoperable statewide radio system through the development and interconnection of coordinated Concept Demonstration Projects (CDPs).

The NTIP system is defined as CDP #2 in the State's plan. This RFP is for the procurement of Phase 1 of CDP #2. Future phases of CDP #2 will include the expansion of the system to include all public safety public service agencies (beyond the current law enforcement focus), and the inclusion of mobile data services.

The Lewis and Clark system, which is currently in implementation, is defined as Phase 1 of CDP #1. Additional phases of CDP #1 include the incorporation of state and federal agencies and a geographic expansion to include the counties surrounding the current system.

Additional CDPs will be developed in other regions of the State to create an interoperable "System of Systems" or a unified statewide system. The bidder shall provide a detailed narrative discussing the capabilities of their proposed solution in this environment.

3.3 Vendor Recommended Alternatives and Design Options

The NTIP Consortium is interested in procuring the best system that meets the requirements outlined in this RFP. These specifications are structured around the functional requirements of the NTIP Consortium, its members, and the State of Montana. Due to the architectural differences between various vendors' systems, the bidder is provided the latitude to propose system designs which meet the functional requirements as outlined in this RFP.

All proposals must address the system functional requirements outlined in this RFP. However, bidders are encouraged to provide network designs and radio site selection that they believe will enhance performance and reliability, improve coverage, provide more efficient use of radio frequencies or feel will be in the best interest of the NTIP agencies and/or state of Montana.

Bidders are further encouraged to construct their proposal in a manner which allows the State to chose a cost effective solution matching the funding available.

The bidders may propose alternative solutions to meet the requirements of this RFP. These alternative proposals may be considered by the NTIP Consortium at its discretion however, alternates must be specifically noted so in the response to the RFP, otherwise the NTIP Consortium will assume that the bidder will comply with all specifications.

The State and the NTIP Consortium reserves the right to declare alternative proposals as non-responsive in favor of a compliant proposal without explanation.

Unless exceptions are specifically and clearly listed in the bidder's response to this RFP, the State and the NTIP Consortium will assume that the bidder agrees to all provisions contained in this document, and is compliant. Should exceptions be made, all exceptions must be specifically identified as an EXCEPTION or CLARIFICATION. A full explanation of the rationale for exceptions must be provided.

4 Functional Requirements

The bidders shall propose the detailed design and implementation of a system that meets, to the greatest extent practical, the following functional requirements. Deviations from these requirements must be clearly indicated as CLARIFICATIONS or EXCEPTIONS. Clarifications and Exceptions should include sufficient detailed narrative for the evaluation of the impact on the system design, operation and overall goals.

4.1 VHF Voice Radio System General Requirements

The VHF voice radio system is intended to upgrade and/or replace the communications of the many NTIP member agencies. The system has a three-fold function.

1 Providing interoperable communications between the various local, state and federal law enforcement agencies on a daily and emergency basis.
2 Providing enhanced and improved local communications for each of the local law enforcement agencies
3 Providing wide area communications for the State law enforcement agencies that operating in the region.

The bidders are cautioned that the fundamental requirement for this system is to meet these three broad based needs of the many agencies that will share this system. These three requirements are absolute.

4.1.1 Sites Selection Requirements

The state of Montana and the NTIP member agencies own and/or utilize a number of radio sites throughout the region. These sites, as listed in Appendix C, are considered the preferred sites for this system. Bidders are not limited to these sites and are free to select other radio site locations; however the selection of sites other than the preferred sites shall include a detailed justification. Radio sites that are not included in Appendix C but are in use by State or local government agencies may be considered the same as preferred sites, providing they can be used by the proposed system under the same terms as the existing system

The bidder shall provide with their proposal a detailed narrative explaining the methodology used in the selection of the radio sites used by their proposed system. This methodology is expected to be utilized for the selection of radio sites during the final detailed design.

4.1.2 Frequencies Selection Requirements

The potential land mobile radio frequencies to be used in this system include the existing frequencies in use by the radio systems being replaced and/or upgraded. These frequencies shall be found in, or referenced to in Appendix - D of this document. Some of these frequencies may not be available or may be in use at other locations. It is the responsibility of the bidder to complete the list of frequencies to fulfill the system requirements.

The bidder shall provide a detailed narrative describing the process of selecting and acquiring the radio frequencies required to implement the proposed system.

The successful bidder will be responsible for all activities required to locate, acquire, coordinate and license any additional frequencies as needed to satisfy the requirements of their proposed system.

4.1.3 P25 Requirements

The State of Montana Statewide Interoperability Executive Counsel (SIEC) has selected P-25 Phase 1 as the standard for digital voice radio communications systems. These standards are to be adhered to, to the greatest extent possible. Deviations from these standards shall be thoroughly explained in the bidder's proposal.

The bidder's proposed system should meet as a minimum the P-25, Phase 1 Standards as applicable to the proposed system.

The bidder shall clearly identify if and where any proprietary formats, interfaces, protocols and feature sets are used when a viable P-25 standard is available.

If the bidder includes any proprietary formats, interfaces, protocols and feature sets as described above, the bidder shall include a detailed narrative of their intention to migrate to published specifications. This information must include delivery schedules for any and all upgrades necessary. The bidder shall provided guaranteed pricing for these upgrades in their cost proposal.

The bidder's proposed system should meet as a minimum the P-25 Standards listed below.

Common Air Interface (CAI), Mandatory Services:

- ANSI/TIA102BABA
  - IMBE Vocoder Description
- ANSI/TIA102BABB-A
  - IMBE Vocoder Conformance
- TSB102-A ANSI102BAAA
  - 12.5 kHz Channel Bandwidth
- ANSI/TIA102BAAA
  - FDMA
- ANSI/TIA102BAAA
  - QPSK-C-C4FM

4.1.4 VHF Conventional Requirements

The VHF conventional systems proposed shall meet the following requirements and provide the following features and functions.

The VHF conventional radio system equipment proposed shall be of standard manufacture and designed for dual-mode, analog FM and Digital P25 operation in the VHF High Band in accordance with all applicable EIA and TIA standards, and shall be FCC type accepted for the intended operation.

Each base station radio shall be provided with all the necessary base station control circuitry required to interface with the required transport and/or control equipment.

Each base station radio proposed shall be capable of being upgraded for inclusion in a P25 trunked system, for the inclusion of digital data communications, and/or the inclusion of encrypted digital voice communications. This requirement does not intend that any station not requiring these features and functions be equipped with unneeded equipment, just to ensure that they may be added without replacement of the base station.

Each base station radio shall be capable of operating in a full duplex manner on a single VHF frequency pair, or in a simplex manner on a single VHF frequency, as required per the bidder's system design.

All base station equipment shall be of fully solid-state design, using transistors, integrated circuits and other silicon based devices. All base station radio equipment shall be constructed using commercial grade circuit boards and components throughout the equipment to maximize the life expectancy, and in keeping with good engineering practices. All tunable and adjustable circuit elements shall be easily accessible.

If the base station/fixed site equipment requires continuous power to maintain its operational state (e.g. mode settings, etc), then the equipment provided at each site shall be supplied with a rack mount Uninterruptible Power Supply (UPS) or other battery power

system. The UPS provided will be required to provide full load capability for the provided equipment for a minimum period of 30 minutes. This will allow for smooth transition to backup power supplied by generator power. The bidder shall provide a full description and operating specifications for the UPS or battery back-up equipment to be provided.

The conventional stations proposed shall incorporate the following control functions unless they specifically conflict an aspect of the Bidder's system design:

- CTCSS/Squelch System with Squelch Tail Elimination
  In Analog modes the stations shall employ Continuous Tone Controlled Squelch System (CTCSS) for both transmit and receive. The base station receiver shall be capable of being configured for "AND" squelch operation such that both noise squelch and CTCSS circuits are operating simultaneously.

- Repeater Disable
  On each station configured for repeater operation it shall be possible to disable the repeat function from a remote dispatch location. When disabled the station shall operate as a full duplex base station.

- Receiver CTCSS Disable
  Provides means for monitoring the receive channel by positively disabling the receiver tone squelch from a remote dispatch position as well as locally.

- Time-Out-Timer
  Limits all transmissions to a maximum time set in programming, thereby preventing the transmitter from locking in the "on-the-air" mode.

- Station Identifier
  The repeater station system shall be equipped with an automatic Morse Code identifier and shall operate to meet FCC requirements during all modes of operation. The station identifier shall be programmable as to frequency and interval.

The vendor is required to state compliance or non-compliance to the following P-25 Phase 1 features per all applicable TIA standards for all stations capable of operation in a conventional mode:

Mandatory Conventional Features

- Unaddressed Voice Call
- Analog Mutual Aid

Standard Optional Conventional Features:

- Group Voice call
- Individual Voice Call
- Call Interrupt
- Discreet listing
- Silent Emergency
- Radio Unit Monitoring Remote Monitor
- Talking Party Identification
- Call Alerting
- Radio Unit Disable/Re-enable

The bidder shall clearly identify if and where any proprietary formats, interfaces, protocols and feature sets not made available to competing vendors are used within their system.

If the bidder includes any proprietary formats, interfaces, protocols and feature sets as described above, the bidder shall include a detailed narrative of their intention to migrate to published specifications. This information must include delivery schedules for any and all upgrades necessary. The bidder shall provide guaranteed pricing for these upgrades in their cost proposal.

4.1.5 VHF Trunking Requirements

The VHF trunking systems as proposed shall meet the following requirements and provide the following features and functions. This includes the wide-area trunked sub-system and the local-area trunked subsystem described in the Baseline Design document, as well as any other trunked systems or sub-systems proposed.

The VHF trunking radio system equipment proposed shall be of standard manufacture and designed for dual-mode, analog FM and Digital P25 operation in the VHF High Band in accordance with all applicable EIA and TIA standards, and shall be FCC type accepted for the intended operation. Trunking operation shall meet all requirements of APCO Project 25 as a minimum.

Each base station radio proposed shall be capable of being upgraded for the inclusion of digital data communications, and/or the inclusion of encrypted digital voice communications. This requirement does not intend that any station not requiring these features and functions be equipped with unneeded equipment to enable these features, just that they may be added without replacement of the base station.

All base station equipment shall be of fully solid-state design, using transistors, integrated circuits and other silicon based devices. All base station radio equipment shall be constructed using commercial grade circuit boards and components throughout the equipment to maximize the life expectancy, and in keeping with good engineering practices. All tunable and adjustable circuit elements shall be easily accessible.

The vendor is required to state compliance or non-compliance to the following P-25 features per any applicable TIA standards for all stations capable of operation in a trunked mode:

Mandatory Trunking Features for P-25:

- Broadcast Voice Call
- Individual Voice Call
- Registration
- Roaming
- Analog Mutual aid

Standard Optional Trunking Features:

- Priority Call
- Call Interrupt
- Discreet Listening
- Silent Emergency
- Talking Party Identification

- Call Alerting
- Call Restriction
- Affiliation
- Call Routing

The bidder shall clearly identify if and where any proprietary formats, interfaces, protocols and feature sets not made available to competing vendors are used within their system.

If the bidder includes any proprietary formats, interfaces, protocols and feature sets as described above, the bidder shall include a detailed narrative of their intention to migrate to published specifications. This information must include delivery schedules for any and all upgrades necessary. The bidder must provide guaranteed pricing for these upgrades in their cost proposal.

All trunking repeater and control equipment shall be supplied with a rack mount Uninterruptible Power Supply (UPS) or other battery power system. The UPS provided will be required to provide full load capability for the provided equipment for a minimum period of 30 minutes. This will allow for smooth transition to backup power supplied by generator power. The bidder shall provide a full description and operating specifications for the UPS or battery back-up equipment to be provided.

The trunking system shall support continued operation in the event of a central trunking controller failure or loss of communications with the central trunking controller site. Should the system encounter such a failure, the system should be capable of providing operation independent from any trunked controller. During this operating mode, there shall be some indication provided to the system users. Bidders shall provide a detailed narrative discussion on the ability of their respective systems to maintain trunked operation under various failure conditions.

4.1.6 VHF Encryption Requirement

The VHF P25 digital systems, both conventional and trunked, shall be capable of supporting APCO Project 25 digital voice encryption.

Digital voice encryption shall not affect the system RF coverage range, or degrade the system in any manner.

The capability to carry encrypted radio traffic shall be quoted as an option on a per channel basis for both trunked and conventional channels. The capability to allow console operators to participate in an encrypted conversation shall be proposed as a separate option or per channel depending on the bidder's system architecture. The bidder shall provide a detailed narrative describing the functioning of each encryption option. The bidder shall provide costing for each of these options in the cost proposal.

The vendor is required to state compliance or non-compliance to the following P-25 features per any applicable TIA standards:

Mandatory Encryption Features (For encryption enabled units only):

- DES-OFB, AES Encryption of CAI Voice
- DES-OFB Encryption of CAI Data on Conventional

4.1.7 VHF Data Requirement

The proposed system infrastructure both conventional and trunked, must be capable of being a dual purpose network serving and supporting both voice communications and low-speed (up to 9.6 kbps) data applications. These data services, if so equipped, must be consistent with TIA standards for Project 25 integrated voice and data operating at 9.6 kbps and/or the Project 25 standard for packet data. Vendors shall detail any additional data services being offered on their proposed network.

The bidder shall provide a narrative discussing the advantages and disadvantages of designing the infrastructure to support voice and data on any channel in the system as traffic needs dictate.

The low speed 9600 bps data capability optionally integrated into the system shall be compliant with the following P-25 Phase 1 standards. The vendor is required to state compliance or non-compliance to these and any other applicable TIA standards:

Optional Data Features:

- ANSI/TIA102BAEA, BAEB
  - Radio to FNE Mode of Operation Packet Data
- ANSI/TIA102BAEA, BAEB
  - CAI Conformance to “Um” Packet Interface
- ANSI/TIA102BAEA, BAEB
  - MRC to MDP Interface “A”
- ANSI/TIA102BAEA, BAEB
  - RFG to Host Interface “Ed”
- ANSI/TIA102BAEA, BAEB
  - Individual IP Bearer Service Support (Packet Switched Data)
- ANSI/TIA102BAEA, BAEB-A1
  - SNDCP Support–Auto Data Registration & Roaming (Trunking Only)
- ANSI/TIA102AAAD
  - DES-OFB encryption of CAI data (Conventional only)
- ANSI/TIA102AAAD
  - System Support For Multikey (Conventional only)

The capability to carry digital data radio traffic shall be quoted as an option on a per channel basis for both trunked and conventional channels. The bidder shall provide costing for each of these options in the cost proposal.

4.1.8 VHF Paging Overlay Requirements

Many of the existing analog radio systems support Two-Tone Sequential, Tone and Voice paging on the voice dispatch channels. This functionality must be maintained with the proposed system. The bidder’s proposed system shall include all infrastructure and interface equipment required to support Two-Tone Sequential, Tone and Voice paging on the voice dispatch channels in the analog mode. In area served only by a trunked sub-system, the bidder shall propose an on-system or alternative solution to maintain Two-Tone Sequential, Tone and Voice paging operation on VHF.

4.1.9 VHF Antenna System Requirements

A commercial quality base station antenna system is to be proposed for each radio site. The antenna system design is the responsibility of the bidder. The antenna system design should be such that its operation closely matches the performance modeled in any radio coverage predictions provided as part of the proposal or the project

The bidder is to provide all mounting kits, low-loss tower mounted RF transmission line; VHF antenna duplexer or combiner/multi-coupler system equipment, low-loss, flexible RF equipment interconnect cables; and all cable connectors, cable grounding clamps, lightning protection and mounting hardware required for a complete and operating VHF antenna system.

The antenna system shall be designed to meet current industry standards, and must follow the recommendations of the base station equipment manufacturer and the antenna equipment manufacturer for site installation and quality. The antenna and transmission line equipment and mountings shall be designed to withstand the sever winter weather typical of the Northern Montana region.

The vendor at their discretion may reuse existing antenna equipment and systems. The vendor is responsible for verifying the proper operation of any existing antenna system re-used.

4.1.10 VHF Subscriber Equipment

The bidder shall propose a wide range of field radio equipment including mobile, portable, and fixed control stations. All subscriber radios shall be capable of operating with existing wideband, analog systems, 12.5 kHz analog systems and P25 digital systems.

The proposed subscriber units shall be compatible with emerging Federal government systems. This includes at a minimum P25 CAI and extended frequency band operation covering the Federal frequencies.

All subscriber radios, with the exception of Base/Control Station Package 1, shall include (or optionally incorporate) an emergency button. Subscriber radios shall be quoted as both clear only (non-encrypted) and optionally equipped for secure/encryption transmission units. All subscriber radios shall include automatic user identification and will allow remote shutdown of unauthorized use of the subscriber radio.

The vendor shall detail the complete features of each type subscriber radio proposed including catalog and specification sheets. The bidder will include in the cost proposal, the individual unit costs as well as cost information for all ancillary items offered including but not limited to: batteries (standard and high capacity types), antennas, cases, chargers, remote mobile control heads, re-programming, installation options, etc. The bidder shall provide a package cost for the standard installation, setup and programming of each mobile, portable, and control station configuration.

4.1.10.1 VHF Subscriber Equipment Packages

The bidder shall provide a detailed description and catalog/specification sheets for the following subscriber field equipment packages. If more than one defined package can be served by the same equipment configuration, it should be clearly noted.

The bidder shall provide detailed pricing in the cost proposal for each package configuration. This pricing shall show the unit package price, individual accessory prices, and any quantity discounts.

4.1.10.2 Control Station Packages

Control station packages are intended to be mounted at fixed locations. The base/control Package #1, should be a station similar in design to a high power base station as typically installed at multi-site radio facilities. The remaining control station packages are intended to similar to desktop or

rack mount station equipment based on mobile radio electronics.

Typical control station antenna systems shall include up to 100 feet of 1/2 inch LDF or equivalent cable, a low gain commercial quality antenna, and installation including one exterior wall penetration.

The bidder may optionally quote additional control station configurations. These packages may vary from the four defined packages by the tier of the radio unit, the feature set provided, or the mounting/control configuration.

4.1.10.3 Base/Control Station Package 1

The bidder shall propose a conventional base/control station package consisting of a full-featured station designed for remote mounting and remote control. The control equipment shall be connected to the control station by local in-house cabling or industry standard interfaces and control protocols. The equipment quoted in this package should be designed and intended for use at a multi-station radio site.

The station should be quoted as a complete package with power supply, and mounting accessories, but without an antenna system.

The bidder shall quote as optional the ability to enable secure/encrypted communications, multiple control locations and any other available options.

4.1.10.4 Control Station Package 2

The bidder shall propose a conventional/trunked control station package consisting of a full-featured station designed for remote mounting and remote control. The control equipment shall be connected to the control station by local in-house cabling or industry standard interfaces and control protocols.

The station should be quoted as a complete package with a typical antenna system, power supply, and mounting accessories.

The bidder shall quote as optional the ability to enable secure/encrypted communications, multiple control locations and any other available options.

4.1.10.5 Control Station Package 3

The bidder shall propose a conventional/trunked control station package consisting of a full featured station designed for remote mounting and local/remote control. The control equipment shall be connected to the control station by local in-house cabling, and may use proprietary control protocols.

The station should be quoted as a complete package with a typical antenna system, power supply, and mounting accessories.

The bidder shall quote as optional the ability to enable secure/encrypted communications, multiple control locations and any other available options.

4.1.10.6 Control Station Package 4

The bidder shall propose a conventional/trunked control station package consisting of a full featured station designed for desktop mounting and local control.

The station should be quoted as a complete package with a typical antenna system, power supply, and mounting accessories.

The bidder shall quote as optional the ability to enable secure/encrypted communications, multiple control locations and any other available options.

4.1.10.7 Mobile Station Packages

Mobile Station packages are intended to be installed in motor vehicles and operated from an automotive 12-volt electrical system. All packages shall be supplied with all accessories required to complete a standard installation including a commercial quality permanent mount antenna.

The bidder may optionally quote additional mobile station configurations. These packages may vary from the five defined packages by the tier of the radio unit, the feature set provided, the power level, or the mounting/control configuration.

4.1.10.8 Mobile Station Package 1

The bidder shall propose a conventional/trunked mobile station package consisting of a full-featured high power station designed for remote/trunk mounting and remote/dash control. The control equipment shall be connected to the mobile station by direct wiring and may use proprietary control protocols.

The mobile station should be quoted as a complete package with a typical antenna system, power wiring, and mounting accessories, including a vehicular repeater system compatible with a UHF portable radio. The bidder may propose alternative coverage enhancement solutions using in-band or other technologies.

The bidder shall quote as optional the ability to enable secure/encrypted communications and any other available options.

4.1.10.9 Mobile Station Package 2

The bidder shall propose a conventional/trunked mobile station package consisting of a full-featured high power

station designed for remote/trunk mounting and remote/dash control. The control equipment shall be connected to the mobile station by direct wiring and may use proprietary control protocols.

The mobile station should be quoted as a complete package with a typical antenna system, power wiring, and mounting accessories.

The bidder shall quote as optional the ability to enable secure/encrypted communications and any other available options.

4.1.10.10 Mobile Station Package 3

The bidder shall propose a conventional/trunked mobile station package consisting of a mid-featured high power station designed for remote/trunk mounting and remote/dash control. The control equipment shall be connected to the mobile station by direct wiring and may use proprietary control protocols.

The station should be quoted as a complete package with a typical antenna system, power wiring, and mounting accessories.

The bidder shall quote as optional the ability to enable secure/encrypted communications, and any other available options.

4.1.10.11 Mobile Station Package 4

The bidder shall propose a conventional/trunked mobile station package consisting of a full-featured mid-power station designed for local/dash mounting.

The mobile station should be quoted as a complete package with a typical antenna system, power wiring, and mounting accessories.

The bidder shall quote as optional the ability to enable secure/encrypted communications, and any other available options.

4.1.10.12 Mobile Station Package 5

The bidder shall propose a conventional/trunked mobile station package consisting of a mid-featured mid-power station designed for local/dash mounting.

The mobile station should be quoted as a complete package with a typical antenna system, power wiring, and mounting accessories.

The bidder shall quote as optional the ability to enable secure/encrypted communications, and any other available options.

4.1.10.13 Portable Unit Packages

Portable Unit packages are intended to be hand carried or belt holstered and operated from an attached or internal battery system. All packages shall be supplied with all accessories needed to create a fully functional unit.

The bidder shall quote as optional, additional batteries, battery chargers, carry accessories and any other available options.

The bidder may optionally quote additional portable radio unit configurations. These packages may vary from the four defined packages by the tier of the radio unit, the feature set provided, or the included accessory set.

4.1.10.14 Portable Unit Package 1

The bidder shall propose a portable radio unit package consisting of a full-featured high tier conventional/trunked portable unit designed for public safety applications. A high tier unit typically includes a full keypad to maximize the features and flexibility for the user.

The portable radio unit should be quoted as a complete package with antenna, battery, charger and case.

The bidder shall quote as optional, the ability to enable secure/encrypted communications, additional batteries, battery chargers, carry accessories and any other available options.

4.1.10.15 Portable Unit Package 2

The bidder shall propose a portable radio unit package consisting of a full-featured mid tier conventional/trunked portable unit designed for public safety applications. A mid tier unit typically includes a limited keypad to access predetermined features and functions by the user.

The portable radio unit should be quoted as a complete package with antenna, battery, charger and case.

The bidder shall quote as optional, the ability to enable secure/encrypted communications, additional batteries, battery chargers, carry accessories and any other available options.

4.1.10.16 Portable Unit Package 3

The bidder shall propose a portable radio unit package consisting of a basic featured low tier conventional/trunked portable unit designed for public safety applications. A low tier unit typically does not include a keypad and limits the user's access to features and functions.

The portable radio unit should be quoted as a complete package with antenna, battery, charger and case.

The bidder shall quote as optional, the ability to enable secure/encrypted communications, additional batteries, battery chargers, carry accessories and any other available options.

4.1.10.17 Portable Unit Package 4

The bidder shall propose a portable radio unit package consisting of a basic featured low tier conventional/trunked portable unit designed for public service applications. A low tier unit typically does not include a keypad and limits the user's access to features and functions. A public service portable radio typically does not support secure/encrypted operation, or one-button emergency call.

The portable radio unit should be quoted as a complete package with antenna, battery, charger and case.

4.2 Interconnection System Requirements

The NTIP system will depend on site-to-site interconnection provided by digital microwave, leased digital carrier services (such as Optical Fiber links), or a hybrid of these two technologies. The bidder shall propose a preliminary interconnection design based upon their proposed radio system design. The bidder should evaluate the trade-offs between these two interconnection methods and provide a detailed narrative presenting the rational behind the proposed system.

The final interconnection system will be utilized for many purposes beyond the support of the systems procured as part of this RFP. For that reason, any design must include significant expansion capability, and the ability to be interconnected in a loop configuration for redundancy.

4.2.1 Microwave equipment requirements

The microwave radio equipment shall adhere to industry standards interfaces. The capacity per link shall be DS-3 or OC-3 depending on the system configuration.

DS3 capacity microwave equipment shall be able to be terminated in a variety of configurations up to a composite capacity equal to one DS3. OS3 capacity microwave equipment shall be able to be terminated in a variety of configurations up to a composite capacity equal to four (4) DS3, or 1 OC3.

All microwave links shall be hot-standby or otherwise protected. Hot-standby and other link protection systems shall meet the following requirements:

- In a hot standby radio the modules shall be protected at RF, IF, High Level Multiplex and Low Speed Multiplex levels.
- Radio receivers shall provide both manual and fade initiated automatic errorless switching to the protection unit.
- Recovery of a system from prolonged (greater than 1 min) RF signal loss will take place within 250 milliseconds after a valid signal is restored.
- The Radio shall be designed so that protection circuits and units not in service or operation can be tested and repaired without affecting on-line system operation.
- Partial or complete failure of protection control or switching equipment will not render the microwave link inoperable.
- Space diversity radios shall be available configured for split transmitter operation such that on-line and standby transmitters are connected to separate antenna feeder systems for full system redundancy and antenna feeder system protection using Reverse Path Protection.

All microwave radio equipment shall be operationally compatible with the following types of equipment located in the same shelter:

- AMPS Cellular Base Stations
- Digital Cellular/PCS Base Stations
- FDM-FM Microwave
- VHF Mobile Base Stations
- UHF Mobile Base Stations
- VHF/UHF Hand-held Radios
- Paging/Short Messaging Transmitters

The microwave radio equipment shall not emit Radio Frequency Interference (RFI) to any of the types of equipment listed above at any level above that permitted under FCC Part 15, Subpart B for Class A devices.

The microwave radio equipment proposed will be capable of meeting full specifications when operating in the general vicinity of FM and TV transmitters and vehicular mobile UHF/VHF transmitters.

All microwave equipment supplied by the bidder shall function properly and meet all specifications under the following environmental conditions:

- Full performance 0°C to 45°C
- Altitude to 15000 ft (full performance)

The proposed system must include all microwave antenna systems and components. The bidder proposal shall indicate their responsibility for the selection, sizing, purchase and installation of the antenna, waveguide or coax feeders and supporting hardware at all sites.

4.2.2 Microwave link requirements

The bidder final detailed design shall provide path studies, antenna centerlines, feeder lengths and reliability calculations which have been field verified an engineer qualified in microwave path design.

The bidder's proposed design may rely on path studies that have not been field verified.

The bidder's final design shall be required to meet the system performance requirements between any two sites in the system. The System Performance Requirements are as follows:

System availability;

- The one-way path reliability over any microwave link in the system shall be 99.995% or better at 10-3 BER.

Path Reliability

- This Multipath Reliability shall be calculated using the Vigants method at 10-3 BER.

Rainfall Outage

- Calculate Rainfall Outage per Crane, Zone C (Rate: 102.2mm/hr).

Errored Seconds (ES) - Single Hop

- The percentage of ES shall not exceed 0.005% measured over any 7-day period (30 ES allowed in a 168 hour period at the DS1 level) during the first year of service, on a 1-way, 1-hop system, excluding radio fading effects and equipment degradation due to maintenance actions.

Severely Errored Seconds (SES) - Single Hop

- A 1-way, 1-hop system, not subject to the effects of radio fading, shall produce no more than two (2) SES in a 30-day period, measured at the DS1 level, during the first year of service. A severely errored second shall be defined as a 1 second interval within which at least 1544 bit errors occur at the DS1 level.

4.2.3 Leased Circuit Link Requirements

The bidder's final design shall be required to meet the system performance requirements between any two sites in the system. The System Performance Requirements are as follows:

System availability;

- The link reliability over any link in the system shall be 99.999% or better at 10-10 BER.

Errored Seconds (ES)

- The percentage of ES shall not exceed 0.5%

Severely Errored Seconds (SES) - Single Hop

- The percentage of ES shall not exceed 0.035%.

System Outage

- The bidder shall provide in their proposal a detailed narrative that discusses the process and plans in place to minimize system outages and to mitigate the effects of equipment failures and fiber link cuts. The narrative shall include historical data on any significant failures during the previous 5 years over the links and routs proposed to be used.

5 Coverage Requirements

The NTIP system is intended to improve and enhance radio coverage for the NTIP member agencies and the State of Montana agencies operating in the region covered by the NTIP system. Many of these agencies have existing radio systems which have been implemented and adjusted based on experience. It is critical that the proposed system design ensures that no agency or operation will be negatively impacted due to the radio coverage of the new system. The bidder shall take careful notice of where existing sites are located when designing the new system.

The VHF P25 Voice system shall be designed to provide 95% or better coverage over the operating area of each particular agency for the type of equipment typical for that agency.

5.1 Coverage Prediction Requirements

The bidder shall include with their proposal detailed radio system coverage prediction maps based on the technical and site parameters of

the proposed system. These maps shall become the basis for the system coverage guarantee.

Bidders shall provide computer-generated propagation plots (coverage maps) that clearly illustrate talk-out and talk-in coverage from each radio site used in their proposed systems. These coverage prediction maps shall indicate the area where the users will experience a 95% Covered Area Reliability of receiving DAQ 3.4. The bidders shall provide maps representing both mobile and portable coverage from each site. In addition, the bidder shall provide composite talk-out and talk-in coverage prediction maps for each sub-system. The bidder will also indicate the calculated Service Area Reliability of each sub-system.

Coverage maps shall be prepared for both the talk-out case and the talk-back case. However, the vendor is encouraged to balance talk-out and talk-back coverage. In the case where the talk-out and talk-back coverage is similar, the bidder may include one map which will represent the guarantee for both conditions.

Maps must, at a minimum, include major roads, thoroughfares, jurisdictional boundaries, scale, North reference and major water bodies as reference points.

5.1.1 Coverage Prediction Methodology

The bidder shall submit narrative and supporting documentation that provides a detailed description of the methods and calculations used, and the assumptions made, in predicting the guaranteed two-way radio coverage to be provided.

5.1.2 Individual Coverage Maps

The bidder shall submit individual coverage maps of each site on a scale of 1:500,000 so that they may be overlaid on a standard scale topographical map. The bidder shall also submit final coverage predictions based on actual installed equipment as part of the as-built documentation package.

5.1.3 Composite Coverage Maps

The bidder shall submit a composite coverage map of appropriate scale overlaid on a standard scale map. The bidder shall also submit final system coverage predictions based on actual installed equipment as part of the as-built documentation package.

5.1.4 System Coverage Guarantee

The bidder shall guarantee radio system coverage performance in accordance with the requirements in this RFP. If the radio system coverage performance of the system supplied by the bidder does not meet the requirements of the RFP, the bidder shall modify or otherwise cause the system to meet the minimum requirements of this RFP at no additional cost (direct or indirect) to the State or the NTIP member agencies. The bidder's coverage maps shall define their guaranteed coverage area. Any coverage areas that are less than those indicated on the maps shall be corrected at the bidder's expense. Each bidder shall state a time commitment for correcting such a condition.

System coverage will be verified by actual field measurement during system acceptance testing. System coverage testing may rely on a sample of sites. Should system users expose coverage problem during the system warrantee period, the bidder will be required to thoroughly test, or retest, any area in question.

5.2 VHF Wide Area Coverage Requirements

The VHF wide-area system, as defined in the Baseline Design document is intended to provide 95% Covered Area Reliability of receiving DAQ 3.4 when using a standard mobile radio unit in the P-25 digital mode. This level of coverage is desired over the entire land area of the Northern Tier system, and is required over all of the State and County roads within the region.

Due to the unique requirements of the Glacier National Park, it is understood that some area may not be practical to cover. The bidder is

requested to propose the coverage of these areas as an option outside their primary proposal. They are further encouraged to offer system concepts, or to propose potential radio sites that will address these areas of concern.

5.3 VHF Local Area Coverage Requirements

The VHF local-area systems, as defined in the Baseline Design document are intended to provide 95% Covered Area Reliability of receiving DAQ 3.4 when using a standard mobile radio unit in the P-25 digital mode. This level of coverage is required over the entire land area of each sub-system and is required over all of the State and County roads within the area of the sub-system.

In addition, the VHF local-area systems, as defined in the Baseline Design document are intended to provide 95% Covered Area Reliability of receiving DAQ 3.4 when using a standard portable radio unit in the P-25 digital mode. This level of coverage is required over the entire land area of each municipality or other area with significant development within each sub-system.

6 Site Development Requirements

The bidder is free to propose the specific radio and microwave sites to be used by their system design to meet the requirements of this RFP. The use of existing sites is recommended, but not required. In the case of new radio and microwave sites, the bidder shall provide a site with the infrastructure and systems as defined in these requirements.

If during the site selection process, it is determined that an existing site must be modified or upgraded to be used by the system, the resulting site shall meet these requirements to the greatest extent possible.

6.1 Site Infrastructure

The physical infrastructure of the proposed radio sites shall meet these requirements.

Successful bidder shall furnish detailed site infrastructure design and layout diagrams and obtain State approval for each location prior to construction.

6.1.1 Radio Site Shelter Building

Where a new radio site equipment building is required, it shall be engineered, permitted, furnished and installed by the bidder. This includes the furnishing of all electrical service, labor, materials and foundation, performing all necessary operations in conjunction with the fabrication of a complete equipment building and installation at the designated sites.

The buildings shall be installed with electrical power distribution panels that will accommodate single phase AC power service, as necessary.

The interior height, floor to ceiling, shall be no less than 10'. Overall exterior height is not critical. Buildings shall be equipped with secure doors, power distribution panels, HVAC systems, grounding systems and any other necessary apparatuses to provide for an integrated communications building.

General construction material shall be pre-cast concrete, aluminum or fiberglass. Wherever possible, prefabricated reinforced buildings shall be used. The building shall be constructed of reinforced material and resist penetration of falling objects or projectiles such as a bullet. Buildings must be constructed of fire resistant materials that resist burning. The structure shall also have the structural strength to withstand the high winds common in the area. The structure including the doors or other entrances and vents shall be vandal resistant.

In deep snow areas the shelter shall be provided with an access hatch to either shelter interior or 'foyer' in front of the door to facilitate access. Sufficient lighting shall be provided to facilitate maintenance on all vertical sides of rack-mounted equipment, power generators, batteries and electrical control panels.

The Bidder shall coordinate with each site owner's representative to assure compliance with any special provisions applicable to the site.

6.1.2 Tower

Where a new radio antenna tower is required, it shall be engineered, permitted, furnished and installed by the bidder. This includes the furnishing of all mounting and safety equipment, labor, materials and foundation, performing all necessary operations in conjunction with the fabrication of a complete antenna tower and installation

Towers design for this system consists of the provision of new self supporting or guyed towers, suitable for supporting the system's radio antennas and microwave dishes for the State of Montana's wind loading ratings. It shall be the responsibility of the bidder to determine the appropriate tower type as part of the final detailed design.

All towers must be designed for antenna and transmission line loading per this RFP, plus 50% additional loading (including waveguide ladder(s), feed through and buss bar grounding) for future expansion.

All towers supplied shall include lighting that conforms to FAA and FCC rules. Tower shall be provided with variable intensity strobe lights, allowing the tower to be unpainted. In the event that strobes cannot be used then a dual lamp top mounted beacon shall be supplied. In the event any tower must be painted, then work shall be per FAA regulations.

All towers must be provided with a climbing device, and a climbing safety device, that meets the requirements of the applicable American National Standards Institute (ANSI) standards and OSHA requirements. There must be ice bridging installed between the tower and building. Tower must be equipped with transmission line ladder.

The successful bidder will complete all FAA applications and studies required for approval and submission. All work and materials pertaining to towers must, as a minimum, comply with applicable EIA, FCC, FAA and Montana state standards and regulations.

The Bidder shall coordinate with each site owner's representative to assure compliance with any special provisions applicable to the site.

6.1.3 Site Security

Where a new radio site is required, a site security system consisting of a security fence shall be provided. The fence shall extend around the perimeter of the radio site, including the shelter, tower and any other infrastructure, such as fuel tanks, generator outbuildings, etc. The fence should be of a design that allows for lockable gats and anti-climb provisions. The fence shall be engineered, furnished and installed by the bidder.

The fence gate and all doors of the site building shall have provisions for security alarms that indicate a "door open" condition as well as an intrusion condition (fence cut or climbed, door forced, etc.)

The site shall be be equipped with lighting sufficient to illuminate all shelter doors, walkways and driveways.

6.2 Site Systems

Each new and/or improved site will be required to have the site support systems upgraded as follows.

6.2.1 HVAC

Each site shall have an HVAC system sized to maintain an interior environment between 40 Deg F, and 90 Deg. F. The sizing of

these systems shall take into account the expected environmental conditions at the location of the site. The cooling load shall be calculated at twice that required by the installed equipment.

6.2.2 UPS and Generator

Each site shall have available utility power with backup motor generator sets connected to an automatic load transfer switch and circuit breaker panel at each site. The motor generator set is designed to pick up the load within 15 seconds after the interruption of utility power. If the bidder proposes using a site that does not have such power, or a new site, the bidder must provide the generator system.

The bidders shall proposal a interim power supply that shall provide power to all land mobile radio, microwave, and critical ancillary system equipment, at each site. This power supply shall provide full power within 15 msec after loss of utility supplied power and shall be sized continue to supply power to each system for at least 30 minutes.

There shall be no interruption in service and no need to reboot any equipment during the interval between loss of utility power and the availability of motor generator power provided that the motor generator.

There shall also be protection of electronic equipment from power surges on AC supply lines of up to 150 VAC, short term spikes of up to 1000 V peak, and against brownout power conditions on AC power lines down to 90 VAC.

The interim power supply may be a UPS or backup battery and battery charger. A small inverter may be needed with a backup battery supply to provide AC power to equipment that is not designed to operate on DC voltage.

The bidder shall provide structural engineering and structural reinforcement construction if necessary to support the weight of the battery systems.

Where batteries provide the primary source of power to a critical system, there shall be at minimum dual chargers with either charger being able to supply the load on the battery supply, and battery recharging current, as that load is determined by the bidder. Calculations of that load shall be included in the Proposal. Chargers shall have an input connected to the site alarm network to alert monitoring personnel of a charger failure. Chargers shall have regulation electronics to prevent overcharging of batteries.

Batteries used in DC supply applications, such as microwave equipment, shall be designed and manufactured for a minimum of ten years service life and for high discharge rates. Batteries used in backup power only applications, such as UPS, shall be designed and manufactured for a minimum of five years service life and for high discharge rates. Batteries shall not emit explosive gases into un-vented spaces.

The back-up generator at any site so equipped shall be sized to carry the total load of the site with a reserve capacity of 50%. Generators shall be propane fueled. Fuel storage capacity shall be sufficient to maintain the site for 7 days at 2/3 full load. The Bidder shall coordinate with each site owner's representative to assure compliance with any special provisions applicable to the site with regard to the generator and/or fuel storage.

The power system shall provide a separate circuit breaker for each land mobile radio, battery charger system, and other major component.

6.2.3 Alarms

The bidder is to provide a status, alarm and control system capable of monitoring the status of; environmental conditions, commercial power, generator operation, DC-power, tower lighting, security conditions and system status indications at each site.

The system shall provide remote control functions for interior, exterior, and tower lighting, as well as remote manual control of generation functions.

System alarm reporting shall be displayed at a system-monitoring terminal at the system master control site.

6.3 Equipment Installation Standards

All site equipment shall be installed according to industry accepted standards. The State recommends the use of the R-56 Standards and Guidelines for Communications Sites, published by Motorola.

Notwithstanding the above requirements, it is recognized that the Bidder may have their own quality standards for system implementation. If the If the Bidder desires to use a standard other than those recommended in this RFP, the Bidder should include a current copy of that standard or document. These standards will be considered for approval by the State.

6.3.1 Equipment racking and mounting

All equipment shall be mounted on standard 19-inch racks. Only equipment which is not expected to require service should be mounted in the lower 18 inches of the rack.

All racks shall be secured to prevent the possibility of tipping or falling.

6.3.2 Equipment and site grounding

All racks, cabinets and equipment shall be connected to a single point ground using a #6 AWG or larger, solid, insulated copper conductor. All cable ladder sections shall be properly bonded together and connected to a suitable ground. Some existing facilities may not have a halo ground available. In such cases the Contractor shall connect to a suitable existing ground conductor. The bidder shall provide in their proposal site grounding designs for use if no suitable ground exists. All grounding shall adhere to industry accepted standards. The State recommends the use of the R-56 Standards and Guidelines for Communications Sites, published by Motorola.

Notwithstanding the above requirements, it is recognized that the Bidder may desire to use other grounding standards. If the Bidder chooses to not adhere to the standards included in this RFP, the Bidder should include a current copy of their standards. These standards will be considered for approval by the State.

6.3.3 Antenna and Transmission Line Equipment

The antenna system shall be designed and installed to meet current industry standards, and must follow the recommendations of the base station equipment manufacturer for site installation and quality. The State recommends the use of the R-56 Standards and Guidelines for Communications Sites, published by Motorola.

All antennas, feed lines, connectors, and other equipment are to be installed and mounted in a manner that is consistent with the recommendations of the respective manufacture.

The bidder at their discretion may reuse existing antenna equipment and systems. The bidder is responsible for verifying the proper operation of any existing antenna system re-used.

The Bidder shall coordinate with each site owner's representative to assure compliance with any special provisions applicable to the site.

The bidder shall provide the State with a printed copy or software file of a cable test using a Time and Frequency Domain Reflectometer for every transmission line used by the system.

7 Planning and Management Requirements

The bidder shall propose a schedule, time line, and management plan for the tasks required to design, plan and implement the system in the most cost effective manner. These tasks include the detailed design of the system, and the complete installation, programming, optimization, and testing of the infrastructure

equipment. Additionally, they shall include all system acceptance testing, and system management and user training. ,

This proposed plan will be the basis for the negotiation of a final project plan and schedule to be completed upon contract signing.

The bidder's proposed plan shall take into account the bidder's expectations for pre-contract negotiations, critical path work items, typical manufacturing cycles and time lines, seasonal issues (accessibility to sites, etc.) and prior experience with systems of this scope.

7.1 Program Management Requirements

The proposed design and implementation plan shall detail the Program Management plan to be implemented to insure the successful completion of the project.

At a minimum, the Program Management plan will address the following requirements.

A monthly status report is to be provided to the State upon award of the contract. The project director shall provide a written report on their adherence to the work plan and the occurrence of any technical or managerial problems. The Bidder will provide at the request of the Project Director, oral presentations, detailed reports or status meetings during the term of the Contract.

Mandatory weekly project meetings between the State's and bidder's project manager shall begin three (3) weeks before commencement of any on site work and continue for the duration of the project. The Bidder's project director shall provide within three days of the meeting a written report to include the following minimum items:

- Work scheduled
- Work performed
- Technical problems encountered
- Technical problems resolved
- Management problems encountered
- Management issues resolved

- Attendees
- Technical/management items discussed
- Action items
- Project schedule
- Fiscal report

7.2 Intended Timetable

The Bidder shall provide in his proposal, a Work Plan that clearly and specifically defines each project task and sub-task, and that specifies a completion schedule for each task/sub-task required to complete the project. In addition to the tasks/sub-tasks, the Bidder must also detail the critical decision points and target completion dates for each task. Implementation schedules are to follow the phases as outlined in this RFP.

The Bidder shall finalize the Project Schedule and related implementation plans in conjunction with the State within thirty days of the contract award. If the schedule requires revision due to any delays, the schedule revision shall be presented to the State for approval.

7.3 Implementation Phases and Sub-System Prioritization

The bidder shall propose a phased implementation schedule. The purpose of this phasing to minimize resource loading peaks by offsetting the tasks required within each phase. In addition, the phases shall be structured to insure that at a minimum, in the event of unforeseen delays, the wide-area interoperability portion of the system will be completed prior November 2005. This deadline is stipulated due to the funding source.

The local-area sub-systems shall be scheduled in phases that address the areas of highest need first.

7.4 Site Selection

The site selection process is defined as a critical stage in this program. For this reason, it is called out to be specifically addressed in the bidder's proposal.

The Bidder shall include with their proposal a detailed narrative and plan for site selection. This plan shall address the issues of site acquisition and development if required.

The state of Montana and the NTIP member agencies own and/or utilize a number of radio sites throughout the region. These sites, as listed in Appendix C, are considered the preferred sites for this system. Radio sites that are not included in Appendix C but are in use by State or local government agencies and can be used by the proposed system under the same terms as the existing system may be considered the same as preferred sites.

The Bidder shall provide a detailed narrative of their experience with radio site development and management within the State of Montana and the surrounding area.

8 Acceptance Test

The bidder shall include with their proposal a proposed system test procedure and a management plan for the execution of the system test procedure. The test plan shall include, but not be limited to, the testing of all features and functions mentioned elsewhere in this RFP. The test plan shall cover each major type of equipment and/or software as a separate test and shall include all RFP mandated features and functions of each type of equipment. The plan shall include a list of tests to be performed and how these tests will be administered.

The successful bidder shall submit for approval a detailed system test plan within fifteen working days following State sign-off of the final system design, and individual equipment test procedures within twenty working days of State sign-off of the final system design. Official execution of the test plan and procedures shall not begin without written State approval of the plans and procedures.

The test procedures shall cover each major type of equipment and/or software as a separate test and shall include all RFP mandated and contractually negotiated features and functions of each type of equipment, sub-system, and system. The

test plan shall include, but not be limited to, a list of tests to be performed, a narrative describing and how each tests will be performed, and a management plan detailing how these tests will be administered. It shall include proof of performance of all RFP mandated and contractually negotiated system features and functions.

All test equipment used during any proof of performance tests shall be certified as calibrated, with calibration traceable to NIST. All data collected during proof of performance tests shall be recorded and delivered to the State upon the completion of the acceptance test.

Bidders must provide comprehensive narrative describing the process that will be used to resolve any discrepancies discovered during the execution of the Acceptance Test Plan.

The State reserves the right to witness any and all tests.

8.1 System Staging Test

Prior to delivery to the State, all equipment supplied by the Bidder will be assembled and tested at the system (or sub-system) level in its final configuration. This may be in a staging area at the Bidder's manufacturing facility or in other space under the control of the Bidder.

During this staging testing, the equipment shall be mounted in the racks/cabinets that will be used at the sites and all cables shall be cut to length and installed. The system (or sub-system) shall then be tested for proper and complete operation. The system shall be demonstrated, in terms of its functionality, to the State's representatives.

In addition to any other standard manufacturer's test procedures, the system will be tested for all functions and features as defined in the system design documentation.

The Bidder shall list in the proposal all equipment which will be included in this the staging test. At a minimum it will include:

- All land mobile radio equipment to be located at each site.
- The land mobile radio system network control equipment.

- Microwave terminal equipment delivered as part of the system (or sub-system)
- The site interconnection system interface equipment
- System management equipment
- Antenna combining and multi-coupler equipment
- Power supply, power conditioning, and UPS equipment

8.2 System In-Field Test

The bidder shall conduct a through acceptance test of the radio infrastructure after installation and optimization. The acceptance test shall demonstrate the proper installation of all equipment and proper operation of all features and functions of the equipment, sub-systems, and overall system.

The acceptance test plan shall include a visual inspection, or physical configuration audit, at each installation site to ensure tidiness and workmanship consistent with best current practices.

This audit will include:

- Verification that the radio equipment is operating on the frequencies identified in the system master frequency plan and as listed on the station license, a copy of which shall be posted at each site
- Verification of the tower latitude and longitude are as stated on the station license
- Verification that antennas are mounted at the elevations specified on the respective station license and if directional that they are oriented to the correct azimuth and polarization identified in the system master frequency plan and the station license
- Verification that all site drawings correspond accurately to all installed equipment fixtures, racks, and cabinets
- Verification that microwave path measurements comply with system design requirements
- Verification that site signal-flow wiring accurately corresponds to the cable running lists
- Verification that site status and alarm systems operate properly
- Inventory major material items comprising each site
- Documentation of all uncorrected discrepancies remaining at the site, to be completed before final site acceptance.

The bidder shall include in their proposal a detailed description of the test procedures and a program management plan for the test. The State reserves the right to review and approve all test procedures for completeness and coverage. The State reserves the right to witness all tests.

In addition to the Bidder provided equipment, all existing equipment which is to be included in the final design shall be tested or demonstrated to be fully functional.

8.3 Coverage Test

The bidder shall include with their proposal a proposed system coverage test procedure and a management plan for the execution of the system coverage test procedure. The test procedure will indicate the methodology used to select test locations and the methodology used to evaluate the signal and audio quality at each location. An explanation of how the methodology used will "prove" that the coverage reliability requirement of this RFP shall be met in the defined coverage areas.

The coverage test plan shall include tests demonstrating the coverage and signal reliability from a sample of base station radio sites included in the bidder's proposal. The plan shall also incorporate a system coverage test which will demonstrate the composite coverage of the system in an area with overlapping sites.

The goal of the test is to demonstrate coverage through out the NTIP system area, as a whole, on highways and roads (2 lane), and to verify the coverage prediction maps presented in the proposal and refined in the detailed design. Areas that may not be tested include; inaccessible areas such as military bases, private lands, lakes, federal lands (Inaccessible by road) and parks (Inaccessible by road). The State will work with the bidder prior to testing to determine these locations.

Coverage testing shall be conducted as part of the acceptance testing process to verify that the required levels of coverage performance have been provided.

The successful bidder shall submit for approval a detailed coverage test plan within fifteen working days following the State's sign-off of the final system design. The test plan shall include, but not be limited to, a list of coverage tests to be performed and how these tests will be administered. The test procedures shall cover a sample of base station radio sites utilized in the final system design. The plan shall include testing both talk-out and talk-in coverage from mobile and portable radios. Official execution of the coverage test plan and procedures shall not begin without written State approval of the plans and procedures.

The bidder shall be required to record and certify all test data and the State reserves the right to observe and participate in the testing.

Full-foliated conditions are considered to occur from June 1 to October 1 inclusive. If testing is done under less-than-full-foliated conditions, coverage acceptance will only be conditional. Retesting of the service area using the same method shall be repeated to verify compliance during full-foliated conditions. Final acceptance will only be granted if no coverage-related problems occurred during the full-foliated conditions.

8.4 Final System Acceptance

After successful completion of the System In-Field Test and the System Coverage Test, per the requirements and provisions of this RFP and any subsequent contract, the Bidder may request Final System Acceptance.

Prior to final system acceptance being granted, the Bidder will provide:

- Verification that operational and technical personnel training requirements have been completed.
- Verification that the required documentation and manuals, including training manuals, have been delivered as required by the Contract.
- Verification that all equipment required at all sites, including dispatch centers and network control points has been delivered, installed and tested.

The State reserves the right to wave any formality of the testing, and to allow sub-system or site-by-site testing, as found to be in the best interest of the State. Neither the State's responsibility for system maintenance,

nor the beginning of the warranty period shall commence until Final System Acceptance is granted.

9 System Maintenance and Warranty Requirements

During the warranty period and when under maintenance contract the system will be maintained to the following level of availability:

- Major disruptions include: inoperable dispatch console interface equipment and/or central communications equipment, the failure of one entire remote site or the failure of one radio channel at all sites.

- Minor disruptions include: single channel/site failures, failures of individual mobile radios, and/or their accessories; and feature problems which do not affect system operability.

Repairs for any major disruption shall be started within one hour of reporting, with restoration within four hours. Repairs for a minor disruption shall be started within four hours or the start of the next business day, whichever occurs sooner. In either case, repair work shall continue until service has been restored unless other arrangements have been approved by the State.

The bidder shall establish a methodology for providing maintenance service, to be approved by the State, including: 24-hour trouble desk, trouble reporting forms, trouble reporting procedures, toll free telephone numbers for voice and facsimile, maintenance organizational chart showing supervision and key personnel, and escalation procedures, including named personnel and their office and home telephone numbers. The trouble reporting procedures shall include the ability for the State to elevate any failure to critical level, requiring a response as a major disruption as defined above.

The bidder shall provide monthly maintenance and repair reports to the State through the warranty period detailing specific failures, repairs, and response times.

9.1 System Maintenance Requirements

The bidder shall provide a quotation for an annual maintenance contract after the warranty period. This contract shall be quoted for at least seven (7) one-year periods and shall include all items as covered within the warranty period. All escalation factors are to be stated and explained. The State reserves the right to accept or reject each annual maintenance contract at the expiration of the previous maintenance contract.

The bidder must submit a detailed maintenance plan which includes a list of the bidder's maintenance facilities or any subcontractor's arrangements for maintenance facilities within the State.

Maintenance may be subcontracted to a third-party(ies) in order to adequately cover the State and to provide for rapid response in the event of a service disruption. If the bidder proposes third-party maintenance, the capabilities and locations of the third party shall be adequately addressed in the bidder's proposal.

Maintenance costs are to be quoted for seven annual periods post warranty. All escalation factors are to be stated and explained.

Operation costs are to be estimated for eight annual periods post acceptance. All assumptions are to be clearly stated.

9.2 System Warranty Requirements

The Bidder shall warrant that the equipment to be delivered shall be new, not remanufactured, and that it shall conform to these requirements and be free from defects.

The Bidder shall warrant all materials, workmanship, and the successful operation of all equipment and systems supplied for a period of one year from the date of formal final systems acceptance.

If any defect or malfunction occurs within the warranty period, including non-conformance with these REP requirements or subsequent contract documents, the Bidder shall determine the cause of failure, remove, repair or replace any defective part or parts, deliver and reinstall the part and place the equipment back into service at their cost and expense. The

maintenance shall cover preventive maintenance, repair due to normal usage and emergency maintenance.

The Bidder shall warrant the equipment to be of high quality, suitable for public safety use. It should be free from imperfections, and capable of satisfactory performance under the State's normal operation conditions.

The Bidder will warrant the system both hardware and software during the first year after the final system acceptance. If a failure of equipment fails during this period, the vendor, at his cost, shall repair or replace the defective equipment at no cost to the State.

The Bidder shall warrant that it will maintain a stock of replacement parts for each item included in this procurement and shall be in a position to replace promptly these parts as may be required for a period of seven (7) years. The Bidder shall provide these replacement parts at the same pricing level extended to commercial service agencies.

10 Test Equipment and Maintenance Supplies

The bidder shall provide in their proposal a narrative description and detailed list of the test equipment required to maintain the proposed system. This list will include at a minimum:

- A list of common test equipment, and tools required for installation, operation and maintenance, or to carry out bidder's published test procedures.
- A list of any special test equipment required for installation, operation and maintenance, or to carry out bidder's published test procedures.
- A list of any computer equipment and software required for installation, programming, operation and maintenance, or to carry out bidder's published test procedures.
- Spare parts that are specific to any particular piece of equipment (such as frequency sensitive transmitter and receiver components).
- A service kit to include; all tuning tools, wrenches, and wrist ground straps for each type of equipment, and a set of replacement fuses for each type of equipment at each site, detailed by site.
- An itemized list showing all spare parts and/or modules necessary for a qualified technician to repair or replace each piece of equipment.

The costs of the above listed equipment shall be detailed as line items and shown as optional in the cost proposal (Not included in the system total). The cost of a quantity of these items will be included in the evaluation of the bidder's proposal.

11 Training Requirements

The bidder is responsible for developing a training plan for State and NTIP personnel in the use of the field equipment, and the operation, programming and maintenance of the system and system components. The bidder shall provide a detailed narrative description of the training program in their proposal. In addition, the bidder shall provide a detailed syllabus for each course listing topics and classroom time required for each topic. The bidder shall provide a recommendation for the number of students and classes required to properly support the system.

Each class's cost shall be provided in either a cost-per-class or cost-per-student manner. The minimum and maximum students per class shall be detailed. The bidder shall detail these costs in the cost proposal but not include them in the system total. Training costs will be included in the system cost evaluation based upon the number of classes and students determined during the evaluation of the proposal.

The State reserves the right to produce audio/video recordings of all training at its expense, to provide a permanent training record and system operations record. The Bidder shall provide all training materials and supplies. A complete copy of any and all training materials shall become the property of the State. The training sessions shall be scheduled at times and locations designated by the State.

The State will provide space where training can be conducted. Live equipment to be used in a "hands-on" environment, as well as all supporting equipment, shall be supplied by the Bidder.

Training shall be timed as to prepare affected personnel for proper system operation prior to implementation.

11.1 Technical Training Requirements

The Bidder shall provide familiarization and preliminary maintenance training for a small number of technical personnel during the equipment staging phase of the project. This training will assure familiarization with the system by project leaders and lead maintenance personnel from the State's or NTIP member's staff. The Bidder shall state the number of people who can be trained during staging.

On-site training seminars for first echelon maintenance by State or NTIP personnel shall be provided and shall include complete training, beginning with basic theory through comprehensive coverage of the operation and maintenance of the equipment supplied under this contract. This training shall include access to equipment for hands-on experience.

The Bidder shall supply highly skilled instructing personnel (with extensive training and experience on the equipment supplied under this RFP), and all necessary instructional materials. All manuals, schematics and other printed materials shall become the property of the attendees.

The training seminars shall include but not be limited to the following:

- A presentation of the general communications equipment/system theory, configuration and features.
- A description of routine communications procedures, features, and functions with demonstrations and hands-on participation.
- Field optimization, maintenance and repair of equipment units, circuit boards, modules, assemblies, etc.
- Troubleshooting to the equipment, utilizing the test equipment recommended by the bidder as part of their proposal.

11.2 Management Training Requirements

The selected vendor shall provide familiarization and preliminary operation training for a small number of system management personnel during the equipment-staging phase of the project. This training will assure familiarization with the system by project leaders and lead operational personnel from the State's or NTIP member's staff. The Bidder shall state the number of people who can be trained during staging.

The selected vendor shall provide on-site training seminars for administration, staff and support people who have an on-going role in systems operations is required

The training seminars shall include but not be limited to the following:

- Maintenance of the database via the system manager.
- Use of diagnostics and statistical data
- Fleet management of talk group assignments.
- Report generation.

The selected vendor shall supply highly skilled instructing personnel (with extensive training and experience on the systems supplied under this RFP), and all necessary instructional materials. All manuals and other printed materials shall become the property of the attendees.

11.3 Operator/User Training Requirements

The Bidder shall provide "Train the Trainer" training to State employees and employees of the NTIP member agencies. The training shall be sufficient for each "radio user/trainer to be" to learn the operational concepts, functions and features available on the radio system as a whole, as well as the mobile radios, portable radios, and control stations. The number of classes and students will be determined at a later date. The bidder shall provide a cost-per-class or cost-per-student. The minimum and maximum students per class shall be detailed.

The Bidder will also conduct at least one class in each county served by the system, to be observed by the personnel trained in the "train the trainer" classes so these newly trained trainers can observe how the vendor conducts this training. This training will cover at a minimum;

- The configuration of the new system and its operational modes, including the differences between the new system and the old system.
- Operational theory of control consoles, base repeaters, voting system, RF control stations, mobile and portable equipment, and failure modes of operation.

- Hands-on familiarization with all communications control functions and equipment.
- Proper radio technique.
- Basic mobile/portable/console operator maintenance and diagnostic troubleshooting techniques.

The Bidder shall also provide a series of VHS VCR tapes (or DVDs) to be used for training user personnel on operation of the radio equipment. These tapes/DVDs shall cover the function and operation of all controls, talk group configuration and features available such as set up of private call, use of encryption and use of the emergency button/"man down" features. Separate training tapes/DVDs shall be provided for portable radios, mobile radios, RF control stations and consoles.

The Bidder shall grant permission to the State to copy any provided training materials for the purposes of providing user training. Lesson plans shall be included.

Direct user training for all dispatch personnel for all shifts must be provided. This training shall be performed on the actual dispatch equipment for the system immediately prior to system cutover.
This training shall be quoted on a per-person basis.

The NTIP Project Director shall have final authority on all trainer personnel, content, materials and educational delivery methods to be employed.

12 Technical Proposal Requirements

The flowing outline is to be used by the bidder in preparing their proposal. Each major section should be included as defined and include content covering all sub-sections. The Bidder is permitted to add descriptive section headers as required to insure that they fully present their offering.

Please note, that many of the sections are termed “Preliminary”. This designation is used to differentiate between the Bidder’s proposed system, and the “Final Detailed Design”, which will be a project deliverable due of the successful Bidder.

12.1 Technical Proposal Outline and Contents

1	Technical Proposal
1.1	Executive Summary
1.2	VHF Voice Radio System General Requirements
1.3	VHF System Preliminary Design
1.3.1	Local Area System Descriptions
1.3.1.1	System Narrative
1.3.1.2	Detailed Features List
1.3.1.3	Preliminary Equipment List
1.3.1.4	Preliminary Site List
1.3.1.5	Preliminary Radio Propagation Analysis
1.3.2	Wide Area System Description
1.3.2.1	System Narrative
1.3.2.2	Detailed Features List
1.3.2.3	Preliminary Equipment List
1.3.2.4	Preliminary Site List
1.3.2.5	Preliminary Radio Propagation Analysis
1.3.3	Data Overlay Preliminary Design
1.3.3.1	System Narrative
1.3.3.2	Detailed Features List
1.3.3.3	Preliminary Equipment List
1.3.4	Paging Overlay Preliminary Design
1.3.4.1	System Narrative
1.3.4.2	Detailed Features List
1.3.4.3	Preliminary Equipment List
1.3.5	Subscriber Equipment Descriptions

1.3.5.1 Fixed Control Station Descriptions
1.3.5.2 Mobile Unit Descriptions
1.3.5.3 Portable Unit Descriptions
1.4 Microwave System Preliminary Design
1.4.1 Backhaul-Interconnection Links Required
1.4.2 Microwave Preliminary Design
1.4.2.1 Preliminary Path List
1.4.2.2 Preliminary Equipment List
1.4.3 Preliminary Leased Circuit Requirements
1.4.3.1 Preliminary Link List
1.4.3.2 Preliminary Interface Equipment List
1.5 Training Plan
1.5.1 Technical Training Plan
1.5.2 Management Training Plan
1.5.3 Operator/User Training Plan
1.6 Preliminary Implementation Plan
1.6.1 Implementation Plan Narrative
1.6.2 Implementation Timeline
1.6.3 Preliminary Statement of Work (SOW)

13 Cost Proposal Outline and Contents

The flowing outline is to be used by the bidder in preparing their cost proposal. Each major section should be included as defined and include content covering all sub-sections. The Bidder is permitted to add descriptive section headers as required to insure that they fully present their offering.

13.1 System Design Costs

Any and all cost to the State or the NTIP Consortium for activities related to the development of the Detailed System Design must be detailed in the System Design Costs section of the Cost Proposal (2.2).

13.2 State Responsibilities

Activities which can not be costed by the bidder and must be carried out by State or NTIP personnel shall be detailed in the State's Responsibilities section of the Cost Proposal (2.3). This information must be listed in

sufficient detail to allow the development of internal cost estimates. These cost estimates will be included in the financial evaluation of the Bidder's proposal.

13.3 Cost Proposal Outline and Contents

2	Cost Proposal
2.1	Executive Summary
2.2	System Design Costs
2.3	State's Responsibilities
2.4	System Equipment and Implementations Costs
2.4.1	Wide Area System Costs
2.4.1.1	Hardware Costs
2.4.1.2	Software Costs
2.4.1.3	Implementations Costs
2.4.2	Local Area System Costs
2.4.2.1	Hardware Costs
2.4.2.2	Software Costs
2.4.2.3	Implementations Costs
2.4.3	Subscriber Equipment Costs
2.4.3.1	Mobile Unit Cost
2.4.3.2	Portable Unit Costs
2.4.3.3	Fixed Control Station Costs
2.4.3.4	Long Term Subscriber Price protection
2.4.4	Microwave Interconnection System Costs
2.4.4.1	Hardware Costs
2.4.4.2	Implementations Costs
2.4.5	Leased Circuit Interconnection System Costs
2.4.5.1	Hardware Costs
2.4.5.2	Implementations Costs
2.4.6	Training Costs
2.4.6.1	Technical Training Costs
2.4.6.2	Management Training Costs
2.4.6.3	Operator/User Training Costs
2.5	System Operation and Maintenance Costs
2.5.1	Wide Area System Costs
2.5.1.1	Hardware Maintenance
2.5.1.2	Software Maintenance
2.5.1.3	Operating Expenses

2.5.2 Local Area System Costs
2.5.2.1 Hardware Maintenance
2.5.2.2 Software Maintenance
2.5.2.3 Operating Expenses
2.5.3 Subscriber Equipment Maintenance Costs
2.5.3.1 Mobile Unit Maintenance Cost
2.5.3.2 Portable Unit Maintenance Costs
2.5.3.3 Fixed Control Station Maintenance Costs
2.5.4 Microwave Interconnection Maintenance Costs
2.5.4.1 Microwave Hardware Maintenance Costs
2.5.5 Leased Circuit Interconnection Operating Costs
2.5.5.1 Leased Circuit Operating Expenses

14 Project Deliverables (Project SOW)

This section may be included either in its current form, or as an appendix.

This is intended to clearly define the selected vendor's deliverables throughout the program.

14.1 VHF System Detailed Design

14.1.1 Wide Area System Design

14.1.1.1 Detailed Features List

14.1.1.2 Detailed Equipment List

14.1.1.3 Detailed Site List

14.1.1.4 Radio Propagation Analysis

14.1.2 Local Area System Designs

14.1.2.1 Detailed Features Lists

14.1.2.2 Detailed Equipment Lists

14.1.2.3 Detailed Site Lists

14.1.2.4 Radio Propagation Analysis

14.1.3 Data Overlay Detailed Design

14.1.4 Paging Overlay Detailed Design

14.2 Microwave System Detailed Design

14.2.1 Backhaul-Interconnection Links Required

14.2.2 Microwave Detailed Design

14.2.2.1 Path List

14.2.2.2 Equipment List

14.2.3 Leased Circuit Detailed Design

14.2.3.1 Link List

14.2.3.2 Interface Equipment List

14.3 Training Plan

14.3.1 Technical Training Program

14.3.2 Management Training Program

14.3.3 Operator/User Training Program

14.4 Implementation Plan

14.4.1 Implementation Plan Narrative

14.4.2 Implementation Timeline

14.4.3 Detailed Statement of Work (SOW)

14.5 Final Cost Analysis

14.5.1 System Equipment and Implementation Costs

14.5.2 Reoccurring Operating and Maintenance Cost Analysis

14.6 Wide Area Trunked Radio System

14.6.1 Manufacture and Stage Equipment

14.6.2 Staged System Acceptance Test

14.6.3 Site Development and System Implementation

14.6.4 Implemented System Acceptance Test

14.6.5 Radio Coverage Acceptance Test

14.7 Local Area Trunked Radio Systems

14.7.1 Manufacture and Stage Equipment

14.7.2 Staged System Acceptance Test

14.7.3 System Implementation

14.7.4 Implemented System Acceptance Test

14.7.5 Radio Coverage Acceptance Test

14.8 Local Area Conventional Radio Systems

14.8.1 Manufacture and Stage Equipment

14.8.2 Staged System Acceptance Test

14.8.3 System Implementation

14.8.4 Implemented System Acceptance Test

14.8.5 Radio Coverage Acceptance Test

14.9 Microwave Interconnection Systems

14.9.1 Manufacture and Stage Equipment

14.9.2 Staged System Acceptance Test

14.9.3 System Implementation

14.9.4 Implemented System Acceptance Test

14.10 Leased Circuit Interface Systems

14.10.1 Manufacture and Stage Equipment

14.10.2 Staged System Acceptance Test

14.10.3 System Implementation

14.10.4 Implemented System Acceptance Test

14.10.5 Implemented System Acceptance Test

14.10.6 Radio Coverage Acceptance Test

14.11 Final Acceptance

14.11.1 Verification of all Acceptance Tests

14.11.2 Development of final Punch List

14.11.3 Finalization of Contract Deliverables

15 Appendices

15.1 A - Baseline Design Document

15.2 B - Agency System Inventories

15.3 C - Preferred Site List

15.4 D - Existing Frequency List